I. C. 6316 JULY, 1930

DEPARTMENT OF COMMERCE

UNITED STATES BUREAU OF MINES
SCOTT TURNER, DIRECTOR

INFORMATION CIRCULAR

SYSTEMATIC TIMBERING RULES AT THE WASHINGTON COAL MINES

BY

S. H. ASH

Digitized by Google

I.C. 6316
July, 1930.

INFORMATION CIRCULAR

DEPARTMENT OF COMMERCE-BUREAU OF MINES

SYSTEMATIC TIMBERING RULES AT THE WASHINGTON COAL MINES[1]

By S. H. Ash[2]

Coal-mine fatalities in the State of Washington have been virtually at a standstill for the 12-year period 1917-1928[3], but show a decline of about 10 per cent as compared with the 12 preceding years, 1905-1916.[4] However, the years 1928 and 1929 have a much more favorable showing than the average of either of the two 12-year periods.

This improvement is probably due to results obtained through the adoption and enforcement of a complete new mining code which went into effect on June 7, 1917, and in which many new features were included. The code has since been amended twice, in 1919 and 1927, primarily to include the operation of safety committees and first-aid education. This is reflected more particularly in the accident statistics of the last two years. Table 1 gives fatality rates in Washington from 1905-1929, and in the United States from 1906-1927.[5]

Table 1.-Fatality rates in coal mines of Washington and in the United States

Years	Number killed	Men employed (average)	Production per death, (short tons)	Deaths per 1,000,000 tons
Washington:				
1905-1916	325	5,558	121,858	8.22
1917-1928	246	4,524	135,408	7.38
1928	9	3,362	279,934	3.57
1929	11	3,279	235,606	4.24
United States Averages:				
1906-1910	2,658	675,068	169,719	5.89
1911-1915	2,517	739,169	210,253	4.76
1916-1920	2,419	760,381	258,944	3.86
1921-1925	2,215	811,803	252,346	3.96
1927	2,224	757,000	269,989	3.70

1 The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used: "Reprinted from U. S. Bureau of Mines Information Circular 6316."
2 Mining engineer, U. S. Bureau of Mines.
3 State Mine Inspector's Report, 1928.
4 State Mine Inspector's Report, 1916.
5 Adams, W. W., Coal-Mine Fatalities in the United States, 1927. Bull. 293, Bureau of Mines, 1928, 126 pp.

Digitized by Google

ACCIDENTS FROM FALLS

In Washington, as elsewhere, the majority of the mine accidents, both fatal and nonfatal, occur at or near the face and are due to falls of roof or coal.

Apparently these accidents are not considered avoidable by many companies, probably because their prevention lies very frequently in the hands of the individual workman; however, this fact does not by any means absolve the management of ultimate responsibility.

No one can question the fact that if the roof or face had been properly supported, in nearly every instance no accident from a fall of roof or coal would have occurred.

Table 2 shows the number of fatal accidents which occurred during 1905 to 1929 at the Washington coal mines due to falls, and gas, or gas and coal-dust explosions.

Table 2.--Fatal accidents at the Washington coal mines due to falls of rock and coal, 1905-1929[1]

Year	Total No. of fatal accidents	Falls of roof		Falls of face or pillar coal		Falls of rock or coal		Explosions of gas or dust	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
1905-1916	325	-	-	-	-	92	28.30	84	25.84
1917-1927	246	74	30.08	13	5.28	87	35.36	22	13.00
1928	9	4	44.44	1	11.11	5	55.55	1	11.11
1929	11	5	45.45	1	9.09	6	54.54	0	00.00

[1] Compiled from reports of State Mine Inspectors.

It is interesting to note the decline in accidents due to explosions and the increase of accidents due to falls. This is also a result of strict enforcement of the new safety regulations relating to gassy mines, and perhaps less strict enforcement of the sections of the mining law relating to timbering. The reason for this is traceable to the fact that, as in times past, the setting of timber lies largely within the hands of the miners.

Statistics in Washington show that the nonfatal accidents due to falls also form about 50 per cent of the total, or the largest percentage of nonfatal accidents from any one cause. The time loss from falls alone averages about 24 days to each accident, and constitutes about 35 per cent of the total time loss due to injuries.

Digitized by Google

CAUSE OF AND REMEDY FOR ACCIDENTS DUE TO FALLS

Accidents from falls of roof or coal are usually caused by lack of proper roof or face support.

With few exceptions this can be blamed on the failure of the individual workman to set timber, whether through carelessness or ignorance, although in a few cases lack of timber has been the contributing cause.

The remedy obviously is to enforce systematic timbering rules by strict discipline for failure to set timber. Experience over a number of years had proved that under the same working conditions fewer accidents due to falls occur at mines where systematic timbering rules are formulated and are actually enforced.

Where systematic timbering rules are made, lack of discipline is the principal cause of accidents from falls of roof, face, or pillar coal.

It is rapidly becoming a recognized fact that lack of supervision and discipline is the major cause of laxity in following safe practice and lack of efficiency on the part of workmen around coal mines. Rules are ineffectual if they are not enforced, and men should be disciplined for violation of rules even if no harm has resulted rather than after the damage is done.

SYSTEMATIC TIMBERING RULES

Slightly Dipping Seam Mines

At some of the slightly dipping seam mines, rules for definite systems of timbering are required. These rules have been formulated by the management, who realized that something had to be done to eliminate accidents due to falls.

The rules are based on slightly worse than average conditions, and place no limit on the amount of additional timber that should be placed if conditions require it.

At one mine, which is working a seam about 12 feet thick on a dip of about 5°, the rule requires props to be set not more than 5 feet apart, irrespective of good roof conditions.

The bottom 5 feet of the seam is extracted in driving the rooms, and the top coal is removed in pillar operations. Most of the accidents at this mine occur during the final removal of the top coal, when the miner neglects to timber or take down a band of coal about 1 foot thick which is at the base of the top coal. This band is locally known as the "mankiller" and it has been the cause of practically all of the fatal accidents occurring at the mine.

This mine has an enviable record from the standpoint of production and accident rate. Accidents from falls are few in number, which is directly attributable to a definite system of timbering enforced by discipline.

Digitized by Google

In order to insure that the timbering rule is complied with, a "safety man" is employed who works immediately under the general superintendent. He takes the matter up directly with the miner involved, in case he finds a violation of the rule; regardless of the condition of the roof, the haulage "turn" in the place is stopped until the work is done, and the timbering later is inspected by the safety man. A recurrence of neglect to set timber on the part of the miner is cause for discharge, and the employees readily approve the application of this rule.

Roslyn Field

In the Roslyn field, where, notwithstanding the normally good roof, most of the accidents due to rock falls occur, the rule is to set props not more than 4 feet apart. The use of mining machines has increased the hazard due to rock falls at the face, as 6 feet of clearance is required at the face. This is taken care of to some extent by a timberman who does nothing but set props within a small section and by a supervisor who has about 20 men under his jurisdiction.

Before the men go to work, all places are examined by a fire boss, who makes a ring on the roof with chalk at such places as require timber to be set to comply with the rule. These props must be set before the miner starts to load coal. In order to see that the rule is complied with, "safety inspectors" such as have been mentioned are employed independent of the immediate district supervisors.

Steeply Dipping Workings

In the steeply dipping workings of western Washington the contracts for piecework state definitely that timber shall be placed in all classes of work according to certain definite specifications. In some instances the timber as set is paid for by the piece. Every two weeks the engineering department, independently of the operating officials, checks the timbering for compliance with the requirements of the contracts. Inadvertently, in some instances, this enforces a safety rule.

Timbering in western Washington is very expensive, notwithstanding the abundance of relatively cheap mine timber, but measured in dollars and cents from the standpoint of operation alone, the failure to place timber is far more expensive, due to the consequent occurrence of caves and, in many instances, the total loss of the working place. The cost of timber varies from 12 to 19 cents per ton. The labor cost for timbering, both in mining and maintenance, is one of the most expensive labor items on the cost sheet.

DISCUSSION OF THE RULE

It might appear that the rule in some sections is not accomplishing the results that it should. This is true especially in the mines of large companies, where a safety inspector covers several mines. The benefits derived are at once apparent, however, when the statistics are reviewed and comparisons are made of accidents before and after the adoption of the rule.

Digitized by Google

Oftentimes, due to the large territory assigned him, the safety inspector can not cover the amount of ground essential to proper supervision of the work and of the workers. In this, strict discipline is absolutely imperative or more harm than good is liable to result from employing the safety inspectors, due to the tendency on the part of some supervisors to rely upon the inspector to enforce the timbering rule.

The supervisor in charge of a district should be held responsible for the strict observance of the rule. He should be disciplined for neglect to enforce it and should be held jointly responsible for laxness on the part of the men. The immediate supervisor is usually more concerned with production, and a great deal of his time is devoted to increasing coal production.

If the work is done on day's pay rather than on contract, men will set more timber for the reason that it is set on company time; but in contract work, they are inclined to set only such timber as is believed actually to be needed at the time, and for this reason more accidents are likely to occur per man-hour of exposure under piecework than under day's pay when no systematic timbering rule is in force.

The district supervisors usually come from ranks other than that of the miner and are selected for their general knowledge and tonnage-production ability rather than for their knowledge of timbering and making roof falls. The tendency is to leave timbering to the judgment of the miner. It is not unusual for a miner to question the supervisor's judgment in timbering, unless a definite timbering rule is in force. For this reason a frequent inspection by the foreman, safety inspector, or some other official obtains better results. Everyone benefits by an occasional prodding, and personal talks are generally effective, when given on the job.

Education at the face and elsewhere plays an important part in preventing mine accidents. A practice several years ago in one of the coal mining districts was to display the rule "A prop every 4 feet," on the moving picture screen at the town theatres. One foreman whenever the State inspectors or fire bosses reported the lack of timber in place would delay the miner's "turn" to receive empty cars until the foreman personally visited the place. This visit was not always made on the same day, hence the workman's earnings were penalized if he failed to place timber in accordance with specifications. A study of the accidents at this mine revealed the fact that this foreman had the best accident record and the worst roof conditions in the district. He had a good production record and is still on duty, although many others are gone; he adhered strictly to the rule "A prop every 4 feet." A safe man pays in the long run, and need not necessarily be inoculated with the "safety bug."

The system in Washington of sending, immediately after an investigation is made of a fatal accident, a detailed report to the individual supervisors, local representatives of the workmen, and the safety committee members, is a step in the right direction. These reports are posted on the bulletin boards at the mines, and are effective as a reminder of unsafe roof conditions and of unsafe practices. They bring the event closer home, and serve the useful purpose of letting all persons know that fatal accidents are still happening. This should not be done, however, at the expense of eliminating a complete statement in the annual report of the State mine inspector.

Digitized by Google

ADVANTAGES AND DISADVANTAGES OF RULES FOR SYSTEMATIC TIMBERING, IRRESPECTIVE OF ROOF CONDITIONS

Advantages of Rules for Systematic Timbering

The advantages of the system are:

1. Fewer accidents occur from falls of roof.

2. The men tend to be less careless.

3. Time loss is reduced, due to fewer injuries, and the closing down of the mine and absenteeism in case of a fatal accident is eliminated.

4. Strengthening of the morale of all men in the mine results in that it is a safer place in which to work.

5. Time loss is reduced by eliminating the necessity of cleaning up rock falls in the working place.

6. Pillar work, usually dangerous because of inadequate timbering or use of timbering practice that was adequate only in the advance work, is made relatively safe when systematic timbering rules are enforced.

7. With efficient timbering, there is less controversy involved as to pay for "dead work" in cleaning up rock falls that occur away from the face. This is especially true in pitching seam workings, where retimbering of crosscuts and of the chutes or breasts near the crosscuts is necessary before the pillars can be removed.

8. Time is saved on account of having to set less timber at the time of starting pillar work, and there is an increase in the amount of coal recovered.

9. In many instances less timber as a whole is required in extracting a given area, because fewer slabs work loose while advancing which will have to be timbered in pillar operations.

10. Fewer chances are taken in the pillars, for the reason that an adequate amount of timber has to be placed regardless of the fact that it is not necessary to go under extracted pillar areas. For the reason just given and unless a timbering rule is in effect, pillar miners often are very apt not to set enough timber to prevent a "cave" that might come without warning, and which in pitching seams might slide and catch the miners.

11. Accident cost is decreased, and there is a saving in human wreckage and dependency.

12. Fall of roof is the major cause of mine accidents, and the elimination of accidents from this cause will directly affect the cost sheet.

Digitized by Google

13. A standard practice, such as a systematic timbering system, is conducive to good habits in work that will prompt the miner to take action to safeguard bad conditions rather than to take chances, which is too frequently the case, simply because he more often "gets away" with it.

14. A closer inspection of the working place is made by the supervisor, as well as the miner who necessarily inspects the roof before setting a prop.

Disadvantages of Rules for Systematic Timbering

The disadvantages of the system are:

1. The extra expense of timbering in places that have better roof than the average, for such a system of timbering must cover the worse than average roof, rather than the good roof situations. The bad places take care of themselves to some extent, as more timber is required and the danger is apparent. The extra cost involved is the cost of the timber itself, as well as the cost of distributing and placing it.

2. In case props are recovered, which is not done in Washington coal mining practice, the cost is greater due to the fact that more props must be removed. This also applies if props must be pulled to effect caves in certain places.

3. In day work the labor cost of extra timbering under good roof falls on the company.

4. In contract or piecework the careful miner may spend his own time setting timber that is not apparently necessary in a location with a good roof.

5. Closer supervision is necessary, although this can hardly be called a disadvantage; but if the rule is enforced, it is absolutely necessary.

CONCLUSIONS AND RECOMMENDATIONS

Washington coal mining practice supports the contention that the first requisite toward the elimination of accidents due to falls is the adoption of systematic timbering rules irrespective of roof conditions. It is the so-called "good" roof that causes most of the accidents.

Such a system finds ample support in standard rules made to eliminate accidents due to certain causes, irrespective of good conditions; they are made to take care of the bad conditions. Reference can be made to the use of clay stemming for blasting irrespective of wet or dry conditions; to the use of closed lights and prohibition of mixed lights; and to the prohibition of use of different kinds of explosives in the same hole. When the same stand is taken as regards timbering, there will be the same decrease in accidents due to the present major cause, falls of roof or face.

The justification of adopting such timbering rules is borne out emphatically in the steeply pitching workings of Washington where necessity forces the miner, irrespective of rules, to put a set of timber at definite intervals. Accidents from roof falls in the advance work are a rare occurrence, where a rule for

Digitized by Google

systematic timbering is enforced, if timber is available. No worse roof conditions are found anywhere than in this State. Very often in times past an investigation at the smaller mines revealed that the miner did not have an adequate supply of timber. This is not the miner's fault and the supervisor should be held responsible. Due to very bad walls in most of the steep pitches, the danger is so apparent that the miner can not and will not take any chances.

In the operation of such a system the miner and supervisor should be disciplined for failure to comply with the rules.

A report of any failure to comply with the timbering rule should be placed on the bulletin board, and violations should be brought up and discussed at safety and supervising staff meetings, singling out the individual cases rather than discussing them generally.

A daily report should be made in writing by the examining fire boss, and the district supervisor, separately, of the conditions of the roof and timbering.

Safety meetings should be held monthly at least.

Under no circumstances should men be allowed to work alone in pillar workings, and the supervisor should be disciplined for not enforcing this rule.

More publicity should be given in mine inspector's and safety inspector's reports to nonfatal accidents due to falls.

Experience attests to the fact that in order to decrease the hazards due to falls, a definite timbering rule should be in effect at all mines. This rule should be based on slightly worse than average conditions, with no limit to the amount of additional timber that should be placed if conditions require it. Where this rule is supported by proper supervision and discipline, there is likely to be relatively little danger from accidents caused by falls of roof.

Digitized by Google